Revised after presentation to PEER Review group to correct errors and further clarify selected issues.

Lower Columbia River Marine Cargo Forecasts

Presented to the USACE Peer Review

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August 5th, 2002

Lower Columbia River Marine Cargo Forecasts

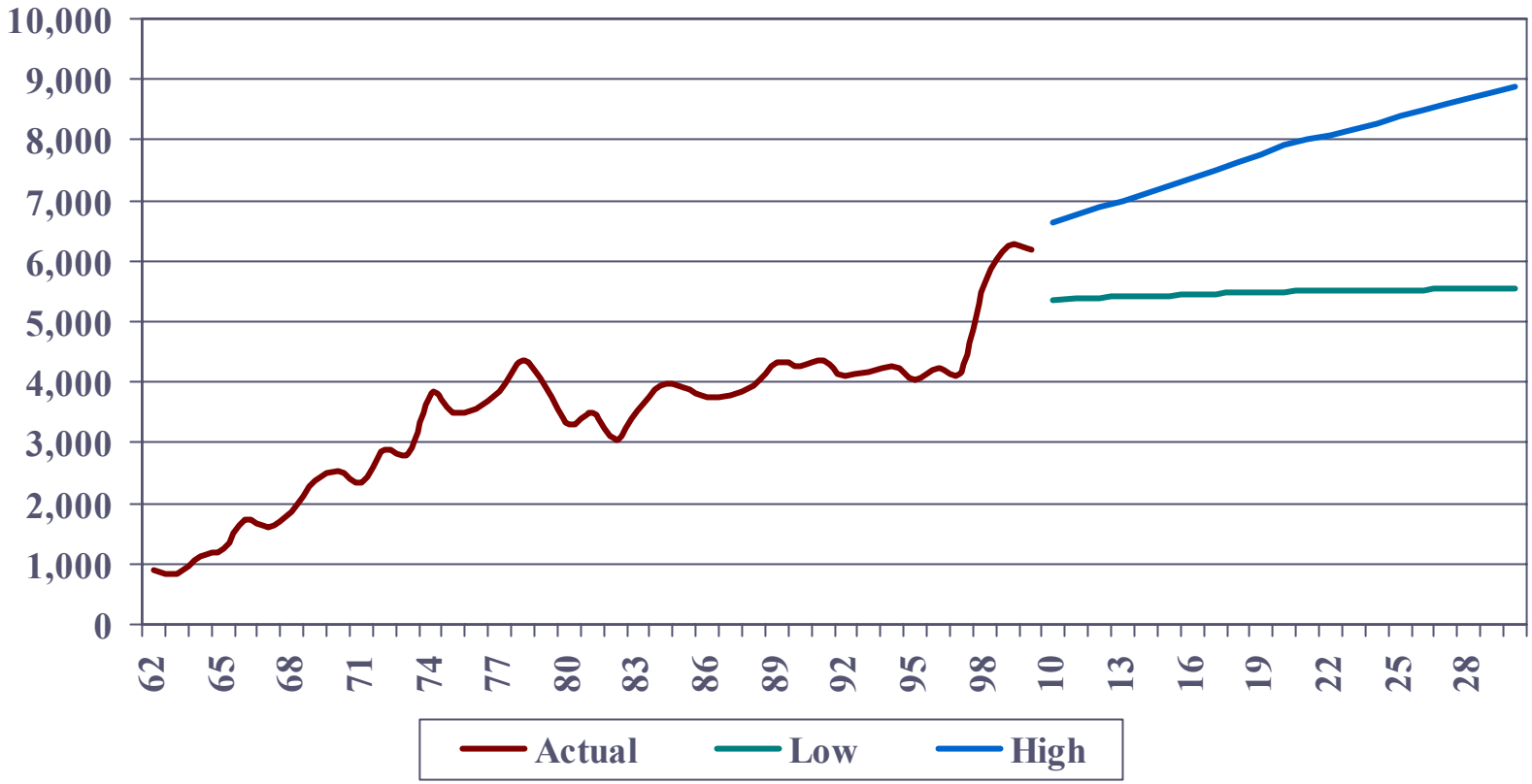
- Overall Results
  - Imports
  - Exports
  - Domestic
- Key Commodities for Deepening Study
  - Grain Exports
  - Containers

Overall Results

Please note that metric tons are used in the overview results section and short tons are used in the other sections, unless otherwise noted (mmt refers to million metric tons, mst refers to million short tons).

Columbia River Cargo Forecasts – Imports

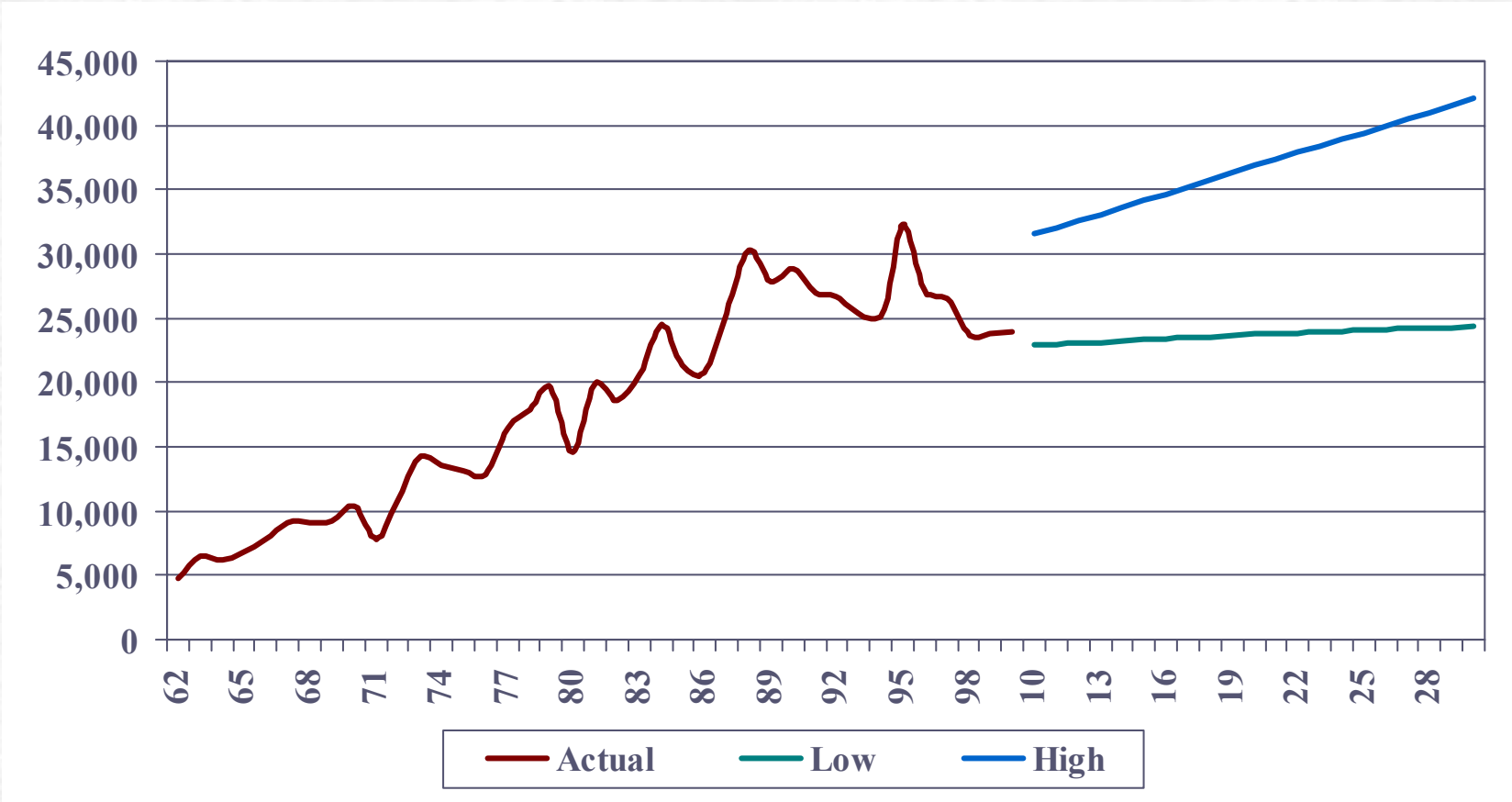
Source: U.S. Maritime Administration, BST Associates, DRI-WEFA (in 1,000 Metric Tons)



Imports increased very rapidly between 1962 and the late 1970s, then were relatively flat from the early 1980s through the mid 1990s. As a result of the strength of the US dollar and other factors, imports surged between 1995 and 2000, growing at nearly 9% per year, surpassing 6 million tons in 2000. The forecast calls for imports to reach a level between 5.5 million tons and 9 million tons by the year 2030, or at average annual rates of –0.3% and +1.2% under low and high growth scenarios, respectively.

Columbia River Cargo Forecasts – Exports

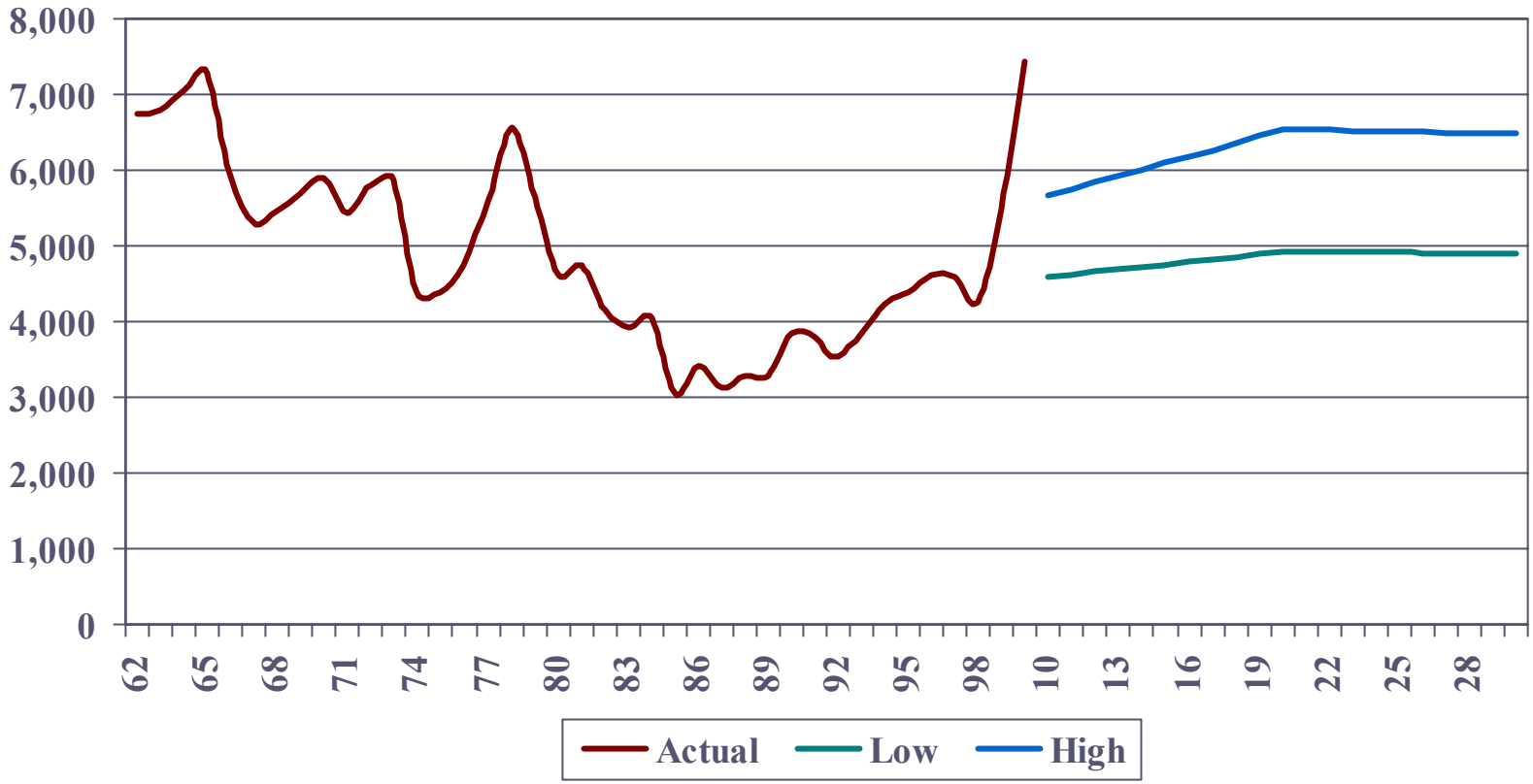
Source: U.S. Maritime Administration, BST Associates, DRI-WEFA (in 1,000 Metric Tons)



Exports also increased rapidly between 1962 and 1990 and peaked in 1995. However, as a result of the Asian Financial crisis in 1997 and the continuing strength of the US dollar, exports declined from the peak in 1995 by nearly 9 million tons, falling from 32.2 million tons to 23.9 million tons. The forecast calls for exports to reach a level between 25 million tons and 42 million tons by the year 2030, or at average annual rates of 0.0% and 1.9% under low and high growth scenarios, respectively.

Columbia River Cargo Forecasts – Coastwise

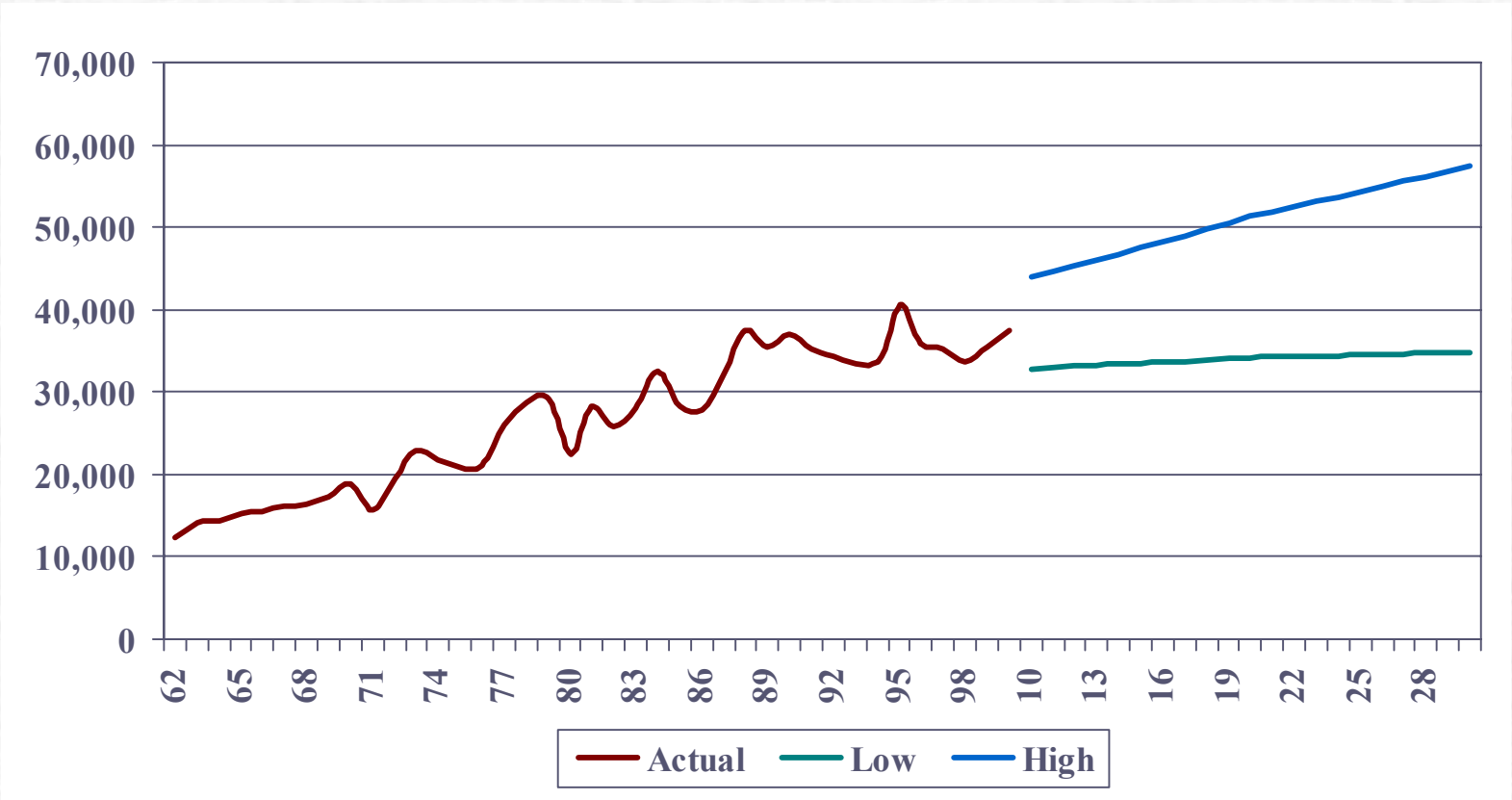
Source: U.S. Maritime Administration, BST Associates, DRI-WEFA (in 1,000 Metric Tons)



Coastwise trade includes domestic waterborne receipts and shipments transiting the Columbia River. Domestic trade declined from 7 million tons in 1962 to 3 million tons in the mid 1980s. As a result of the shutdown of the Olympic Pipeline in 1999/2000, waterborne receipts of petroleum products increased very rapidly (from 2 million tons in 1998 to nearly 6 million tons in 2000). However, the Olympic Pipeline was brought back on line in 2001. The forecast calls for coastal traffic to reach a level between 5 million tons and 6.5 million tons by the year 2030, or at average annual rates of 0.3% and 0.6% under low and high growth scenarios, respectively.

Columbia River Cargo Forecasts – All Cargo

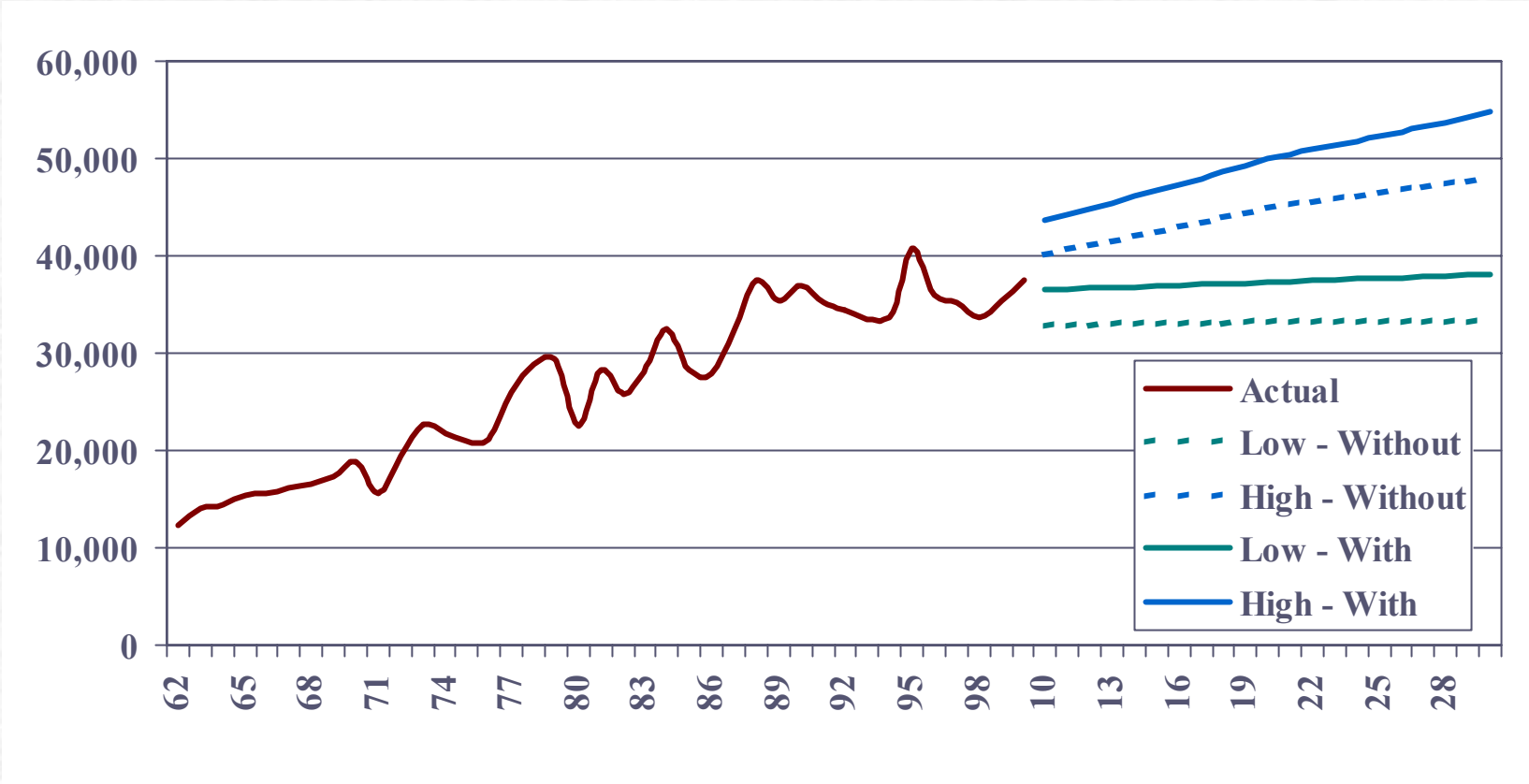
Source: U.S. Maritime Administration, BST Associates, DRI-WEFA (in 1,000 Metric Tons)



Total traffic transiting the Columbia River bar (exports, imports and coastwise traffic) is expected to range between 34 million tons and 58 million tons under low and high growth scenarios, respectively. This amounts to average annual growth of –0.3% per year under the low growth scenario and 1.4% per year under the high growth scenario.

Impact of Deepening on Columbia River Ports

Source: U.S. Maritime Administration, BST Associates, DRI-WEFA (in 1,000 Metric Tons)



The Columbia River Deepening project is expected to impact containerized and grain traffic. Under without project conditions (existing 40-foot navigation channel), the forecast calls for waterborne traffic to reach a level between 33 million tons and 49 million tons by the year 2030. Under with project conditions (improved 43-foot navigation channel), the forecast calls for waterborne traffic to reach a level between 38 million tons and 57 million tons by the year 2030, approximately 19% more than under without project conditions.

Grain Exports

Lower Columbia River
Grain Export Forecasts - Methodology

- DRI-WEFA produces a ten-year forecast of net trade by major importing and exporting region including:
  - Acres in production,
  - Productivity (bushels per acre),
  - Domestic Utilization, and,
  - Exports (net trade).
  - This base was extended to 2030 with DRI-WEFA oversight.
- BST Associates estimated:
  - PNW (Lower Columbia and Puget Sound elevators) market share of US, and,
  - Lower Columbia market share of PNW.
  - Based on shares by major trade route taking into consideration transportation costs.
- BST prepared with and without deepening forecasts but USACE only used the without forecast in the revised deepening study.

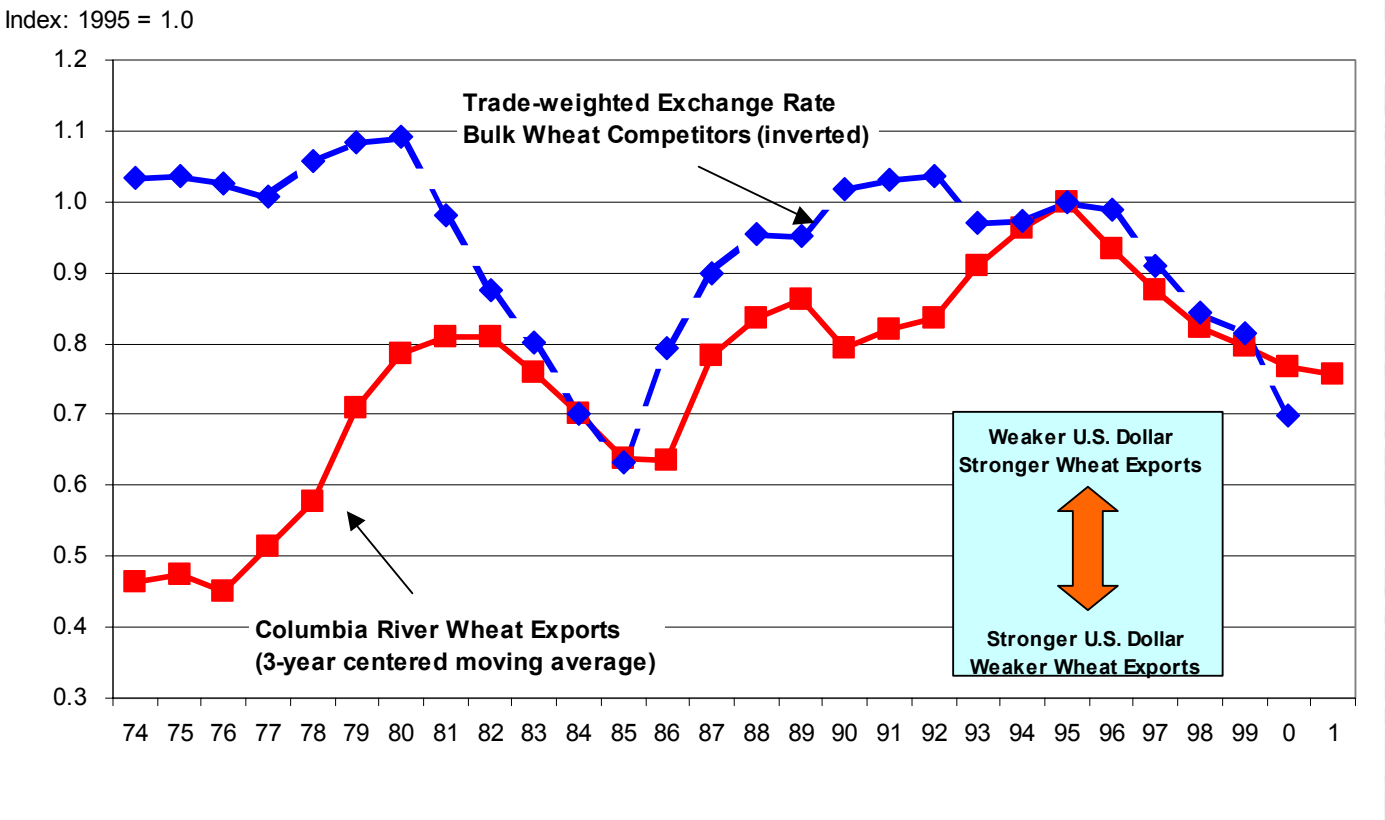
US Wheat Exports – Key Results

- US wheat acreage is expected to decline by 2010 and remain relatively stable (from 25 million hectares in 1990s to 21 million hectares).
- Productivity increases result in US production increase of 10 million metric tons between 2001 and 2010 (~1 million metric tons per year).
- US exports face tough competition from several regions:
  - Especially European Union, Argentina, and Australia, among others.
  - High value of the US dollar and Asian Crisis has impacted exports in last five+ years. US expected to compete favorably in Asian markets (China, rapidly developing Asia, Indian subcontinent).
- US wheat export trade expected to be stable (low) to slight increase (high) between 2000 and 2030:
  - Low Forecast: 0.0% annual growth,
  - High Forecast: 0.7% annual growth.
  - USDA forecasts: 1.7% annual growth from 2000/1 to 2011/12.

US Barley Exports – Key Results

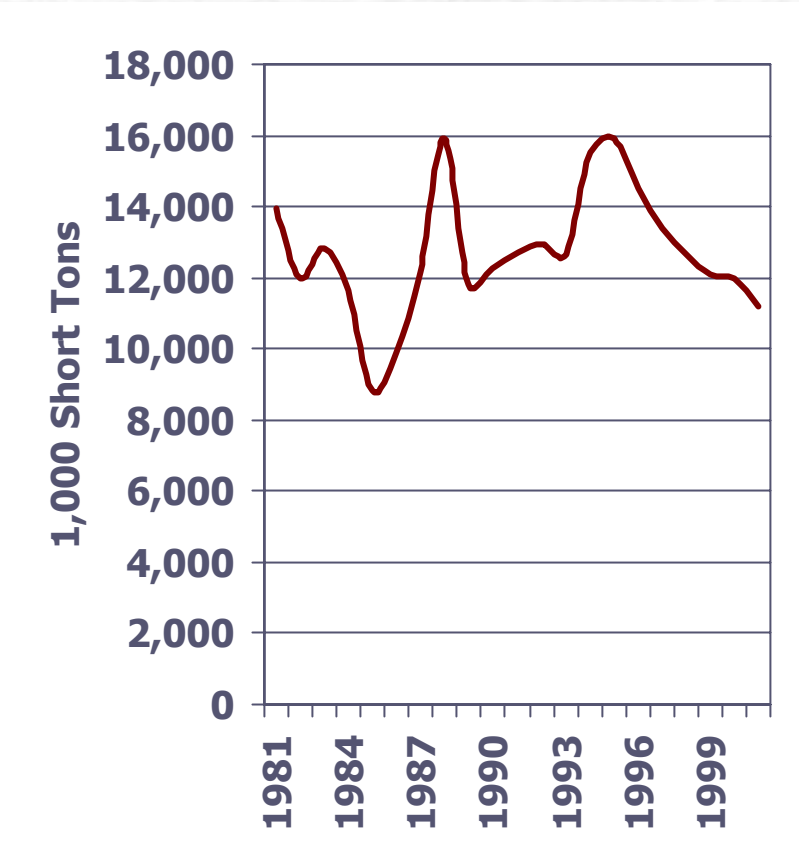
- Barley acreage is expected to decline by 2010 and then remain relatively stable (from 3.4 million hectares in 1990s to 1.9 million hectares).
- US production increases 0.9 million metric tons from 2001 to 2010 (was 10 mmt in 1991, expected to reach 6.6 mmt in 2010).
- US exports remain at relatively low levels throughout the forecast due to competition from several regions:
  - Especially European Union, Australia, and Canada, among others.
  - High value of the US dollar and Asian Crisis has impacted exports in last five+ years.
- US barley export trade expected to be relatively modest by historic standards in 2030:
  - Low Forecast: 0.9 mst,
  - High Forecast: 1.1 mst.
  - USDA forecasts: 0.7 mmt (.77 mst) in 2011/12

Columbia River Wheat Exports vs. Trade Weighted Dollar



Columbia River Wheat/Barley Export Trends

Source: U.S. Maritime Administration, BST Associates (in 1,000 Short Tons)



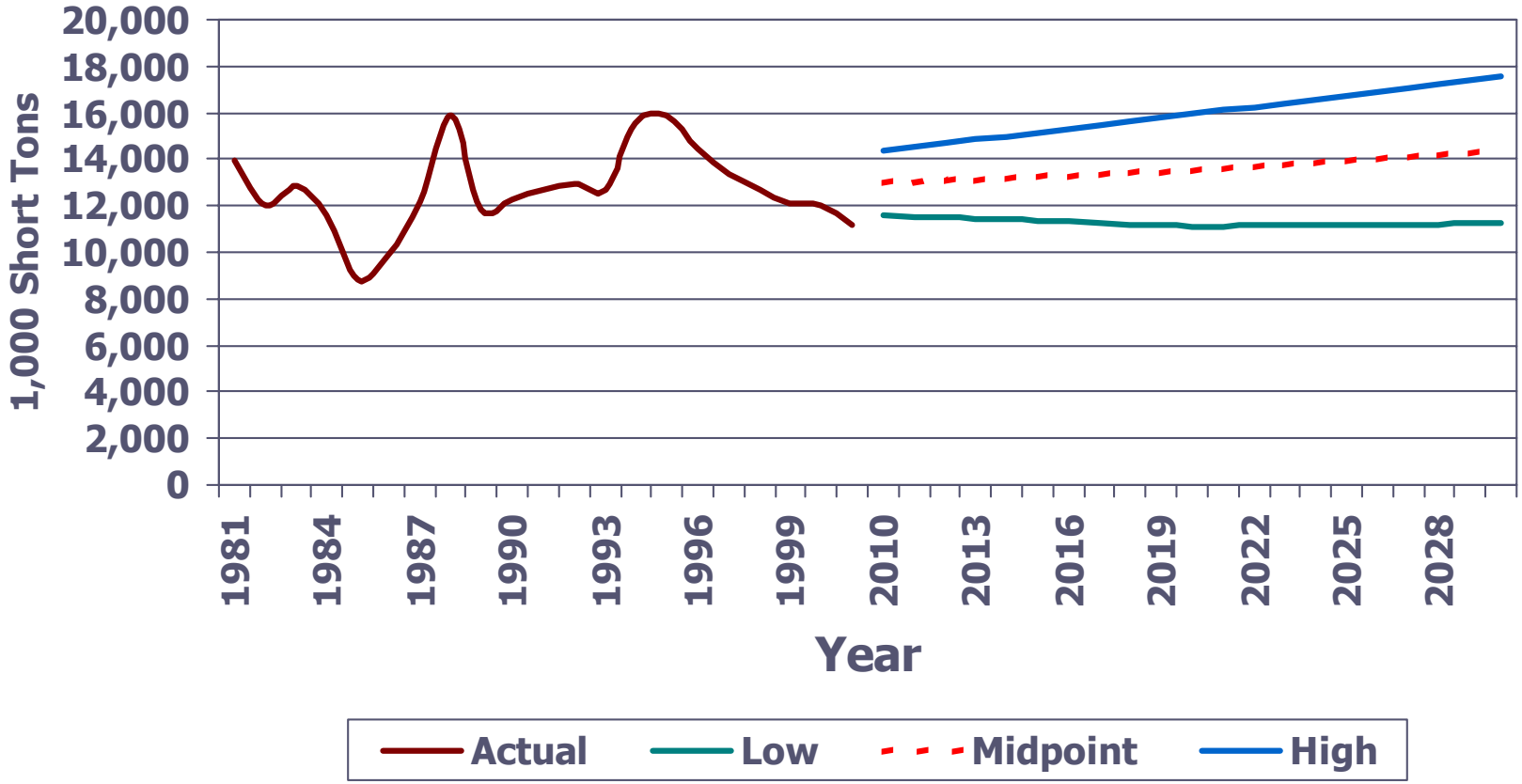
- Wheat/barley exports averaged 13.1 mst since 1995, and 12.7 mst between 1981 and 2001,
- Columbia River market share of US exports:
  - Wheat - increased over time, from 38% to 40%+
  - Barley - increased over time, from 32% to 60%+
- Strength of the US dollar has significantly impacted export sales,
- Columbia River growing regions have also faced droughts during recent past.

Lower Columbia River Wheat/Barley Export Forecasts – Key Results

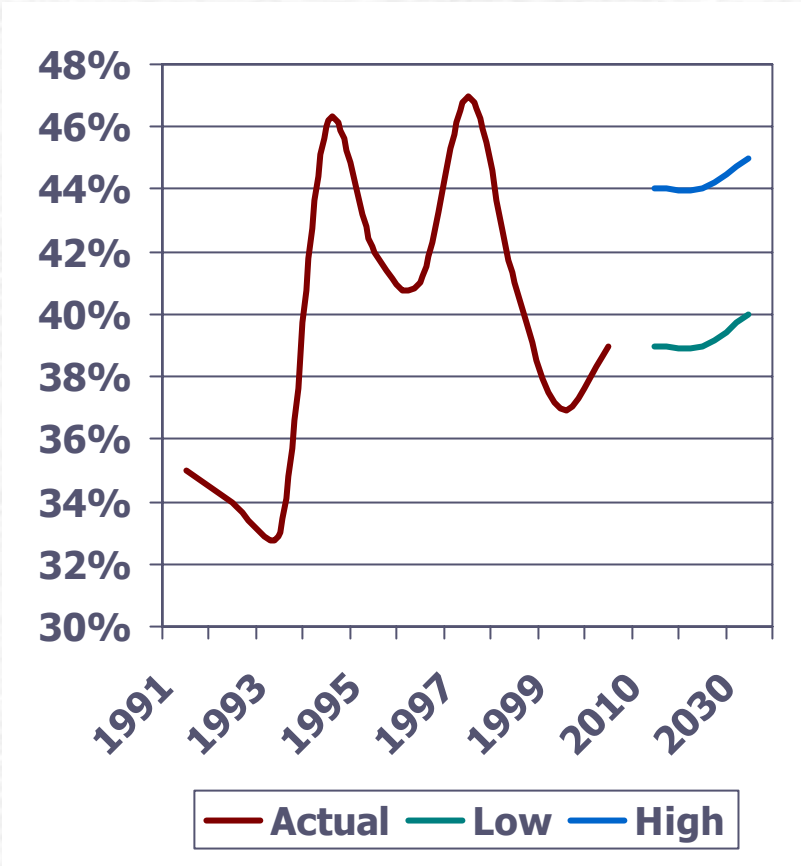
- Virtually all PNW wheat/barley exports move via Columbia River (mainly barge and rail access).
- Columbia River wheat/barley export trade expected to range from a decline (low) to marginal increase (high) between 2000 and 2030:
  - Low Forecast: -0.2% annual growth
  - High Forecast: 1.3% annual growth
  - Midpoint: 0.6% annual growth

Columbia River Wheat/Barley Export Forecast

Source: DRI-WEFA and BST Associates (1,000s of Short Tons)



Columbia River Share of US Wheat/Barley Exports Source: BST Associates



- Columbia River has 100% share of PNW exports of wheat and barley
- Columbia River market share of US:
  - Ranged from low of 33% in 1993 to high of 47% in 1994 and 1998,
  - Under low forecast - share is 39% in 2030,
  - Under high forecast - share is 45% in 2030

US Corn Exports – Key Results

- Corn acreage is expected to grow modestly from 28 million hectares in 2001 to 30 million hectares in 2010 and remain relatively stable at this level. Productivity is expected to continue to increase as well.
- US production is expected to increase by 47 mmt from 2001 to 2010 (1.7% per year to 2010 and 0.5% per year after).
- US exports grow as developing nations adjust to factory style livestock production.
  - China becomes a net importer and other developing Asian countries increase demand. However, US loses market share to other producers (especially Argentina).
- US corn export trade expected to grow modestly:
  - Low Forecast: 0.8% annual growth (2000 to 2030),
  - High Forecast: 1.5% annual growth (2000 to 2030),
  - USDA forecasts: 1.7 annual growth (2000/1 to 2011/12)

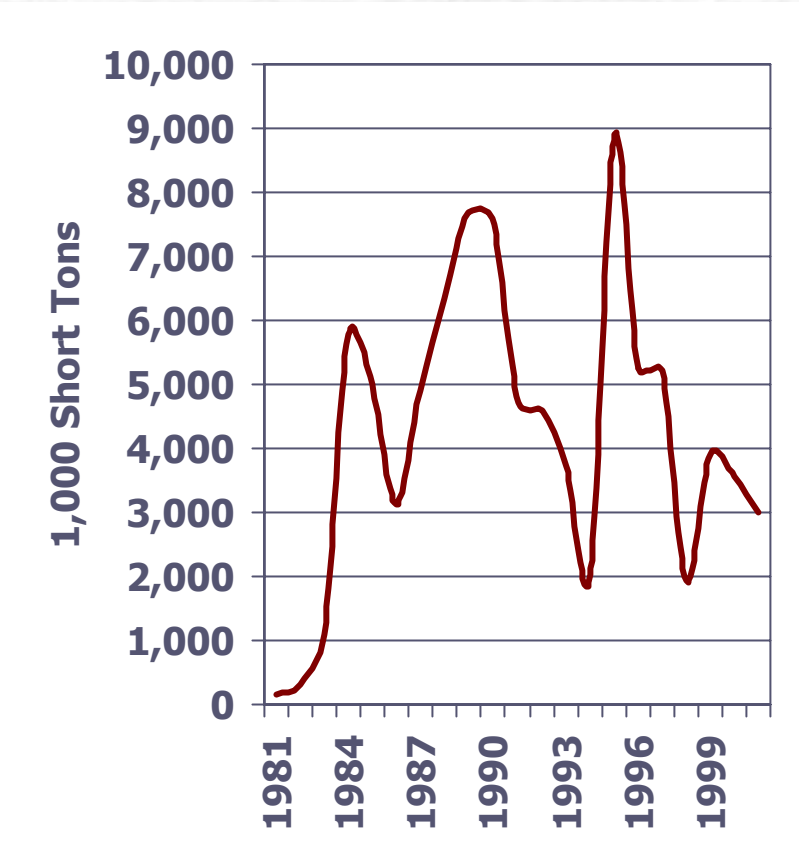
US Sorghum Exports – Key Results

- Sorghum acreage is expected to decline from 4.9 million hectares in 2001 to 3.1 million hectares in 2010 and remain relatively stable at this level. Productivity is expected to continue to increase as well.
- US production is expected to increase by 0.7 mmt from 2001 to 2010.
- US exports are expected to decline slightly under low scenario and remain stable at existing levels under high scenario.
  - US loses market share to other producers (especially Argentina).
- US sorghum export trade expected to grow modestly:
  - Low Forecast: -0.8% annual growth (2000 to 2030),
  - High Forecast: 0.0% annual growth (2000 to 2030),
  - USDA forecasts: 1.9% annual growth (2000/1 to 2011/12)

US Soybean Exports – Key Results

- Soybean acreage expanded rapidly (18%) between 1995 and 2000 as a result of high soybean loan rate. It is expected to grow modestly from this level through the study period. Productivity is also expected to continue to increase.
- US production is expected to increase by 7.6 mmt from 2001 to 2010. However, Brazil/Argentina will gain share of both production and exports due to rapid production and marketing.
- Demand will be strong in China, India and other Developing Asia.
- US sorghum export trade expected to grow modestly:
  - Low Forecast: 1.7% annual growth (2000 to 2030),
  - High Forecast: 2.7% annual growth (2000 to 2030),
  - USDA forecasts: 1.3% annual growth (2000/1 to 2011/12)

Columbia River Corn/Sorghum/Soybean Export Trends Source: BST Associates



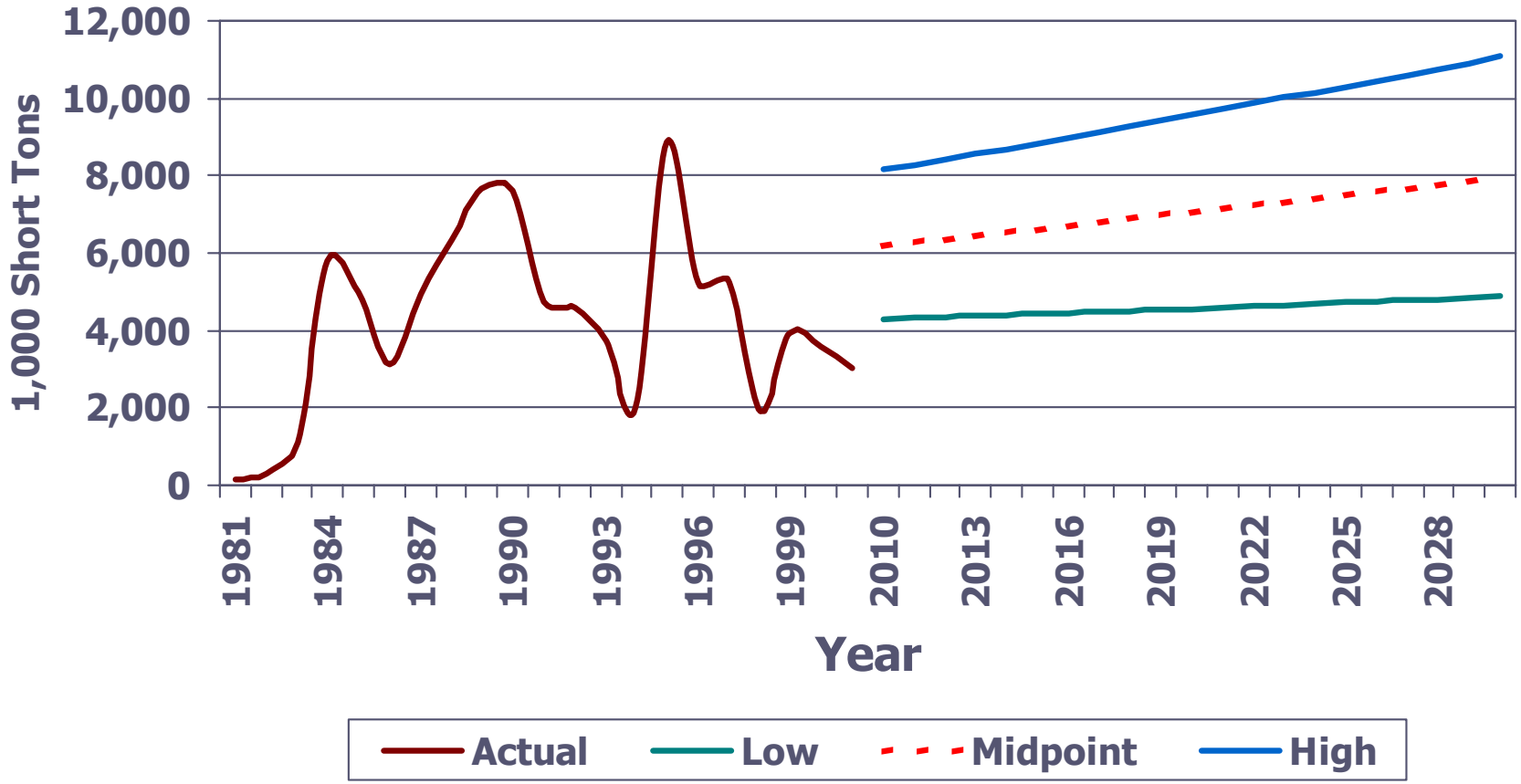
- Corn/sorghum/soybean exports averaged 4.5 mst since 1995, and 4.2 mst between 1981 and 2001),
- PNW share of US:
  - Corn - 11% - 30%.
  - Sorghum – 5% - 9%
  - Soybeans – 5% - 13%
- Columbia River market share of PNW:
  - Corn - 37% - 55%.
  - Sorghum – 43% - 76%
  - Soybeans – 4% - 27%

Lower Columbia River Corn/Sorghum/Soybean Export Forecasts – Key Results

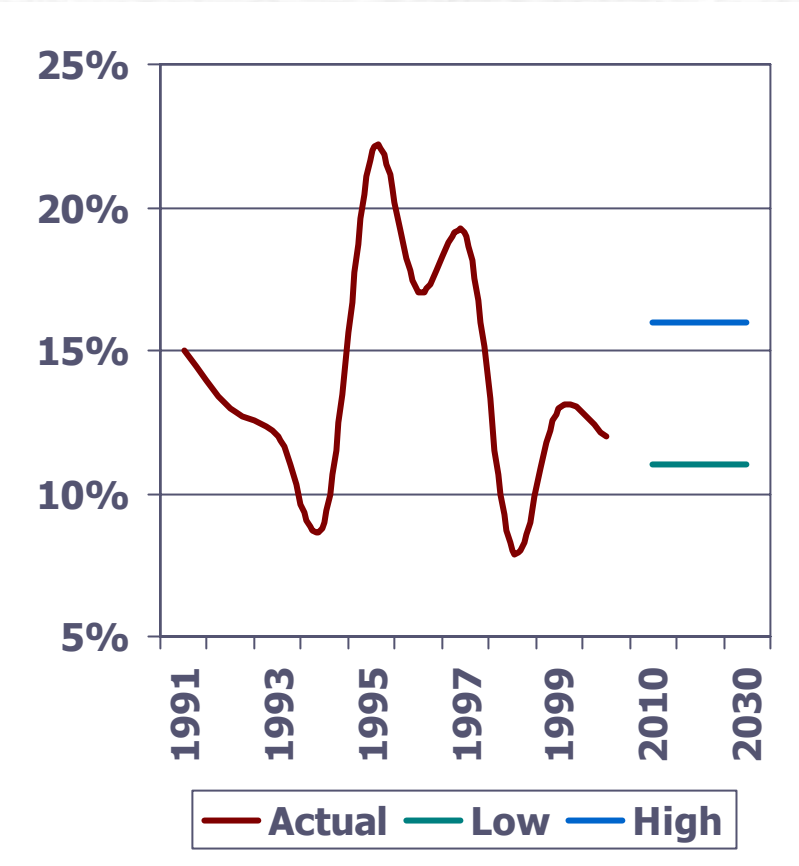
- Columbia River corn/sorghum/soybean export trade expected to range between 4.8 mst and 11.0 mst by 2030, compared with average of 4.5 mst since 1995.
- This equates to annual growth of:
  - Low Forecast: 0.2% annual growth from average,
  - High Forecast: 3.0% annual growth from average,
  - Midpoint: 1.9% annual growth from average.
- PNW is expected to have US share of 11% (low) to 16% (high) - compared with actual shares ranging from 8% to 22% between 1991 and 2000.
- Columbia River is expected to have PNW share of 42% (low) to 50% (high) - compared with actual shares ranging from 35% to 50% between 1991 and 2000.

Columbia River Corn/Sorghum/Soybean Export Forecast

Source: DRI-WEFA and BST Associates (1,000s of Short Tons)

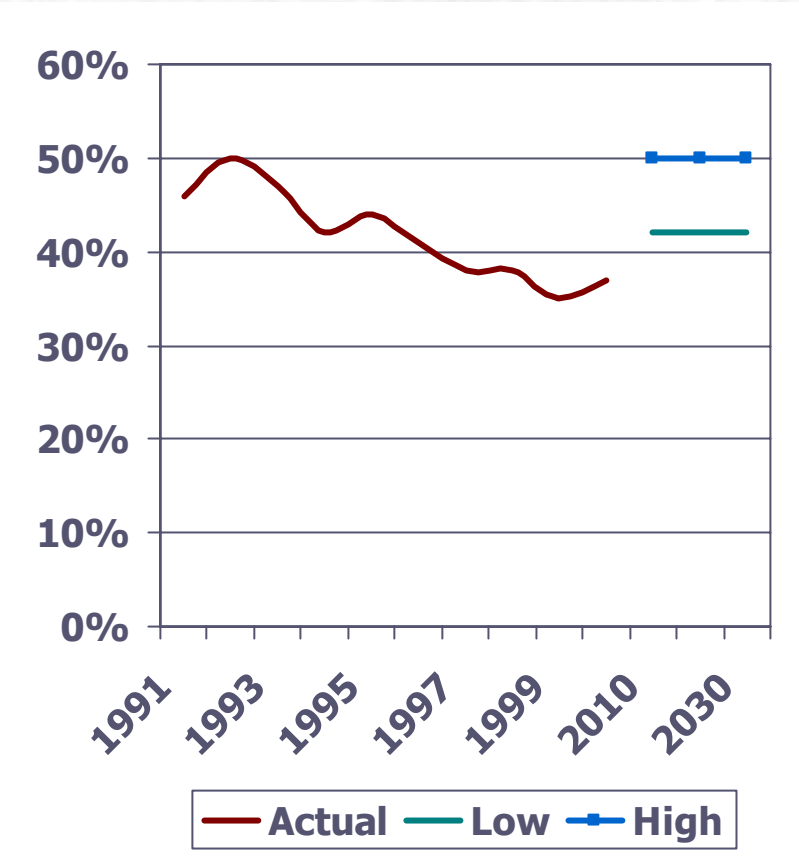


PNW Share of US Corn, Sorghum, Soybean Exports Source: BST Associates



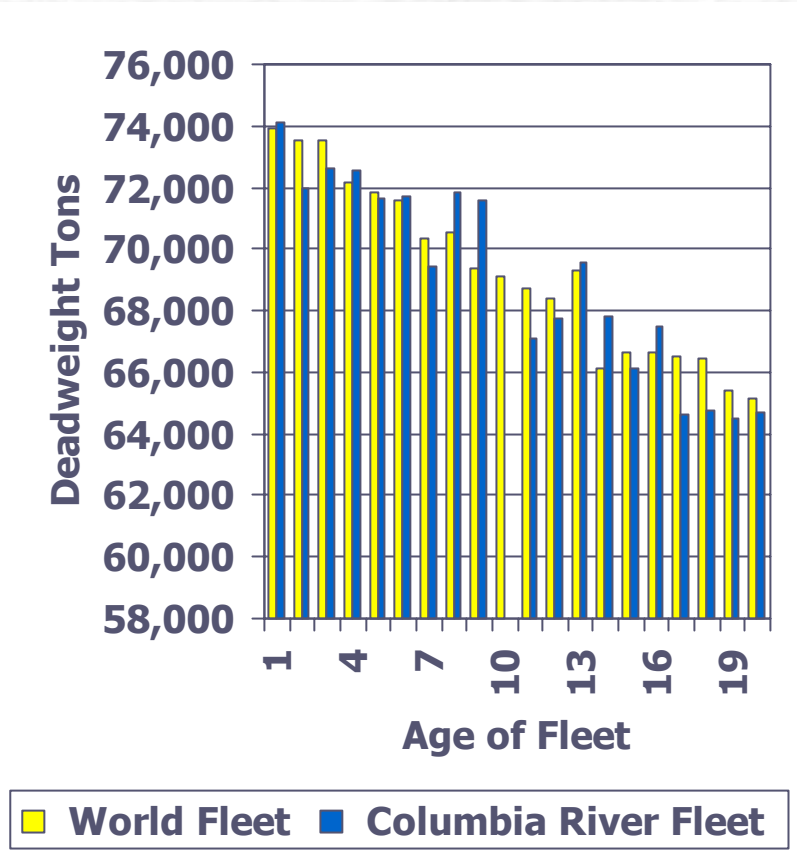
- PNW share of US exports of corn, sorghum and soybeans:
  - Ranged from low of 8% in 1994 to high of 22% in 1995,
  - Under low forecast - share is 11% in 2030,
  - Under high forecast - share is 16% in 2030

Columbia River Share of PNW Corn, Sorghum, Soybean Exports Source: BST Associates



- Columbia River share of PNW exports of corn, sorghum and soybeans:
  - Ranged from low of 35% in 1994 to high of 50% in 1992,
  - Under low forecast - share is 42% in 2030,
  - Under high forecast - share is 50% in 2030

Changes in Panamax Fleet (Source: Lloyd's Register)



- The bulk fleet carrying grain in the Columbia River mirrors the characteristics of the world fleet.
- Newer vessels are being built to carry substantially greater volumes if operated in a single ocean.

Comparison of Load Factors in PNW Grain Vessels in 2000/1 (Source: Port of Portland Utilizing PIERS data)

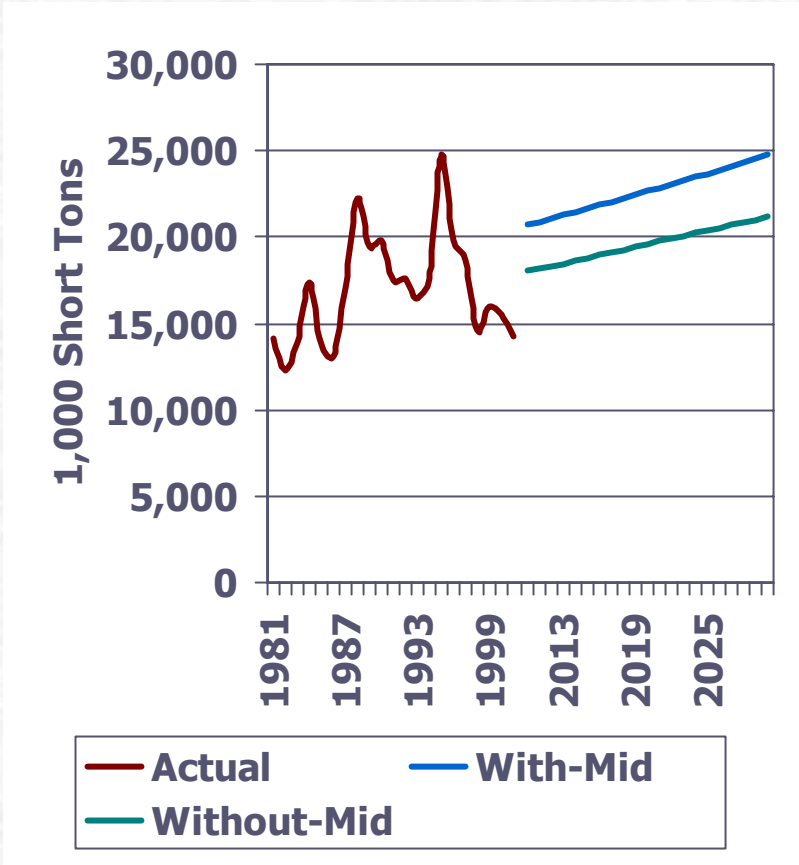
Shipment Size (Metric Tons)	Columbia River	Puget Sound	Total
Under 50,000	2,861,002	2,844,142	5,705,144
50,000 up to 60,000	2,961,718	5,310,297	8,272,014
Over 60,000		3,305,366	3,305,366
Total	5,822,719	11,459,804	17,282,523
Percent of Load by Shipment Size			
Under 50,000	49%	25%	33%
50,000 up to 60,000	51%	46%	48%
Over 60,000	0%	29%	19%

29% of Puget Sound grain exports are in vessels with a load greater than 60,000 metric tons. This size vessel cannot call in the Columbia River under existing channel conditions but could with deepening. This limitation partially explains Columbia River's decline in PNW market share for Midwest grains.

Columbia River Grain Forecast – With/Without Channel Deepening

Source: DRI-WEFA/ BST Associates

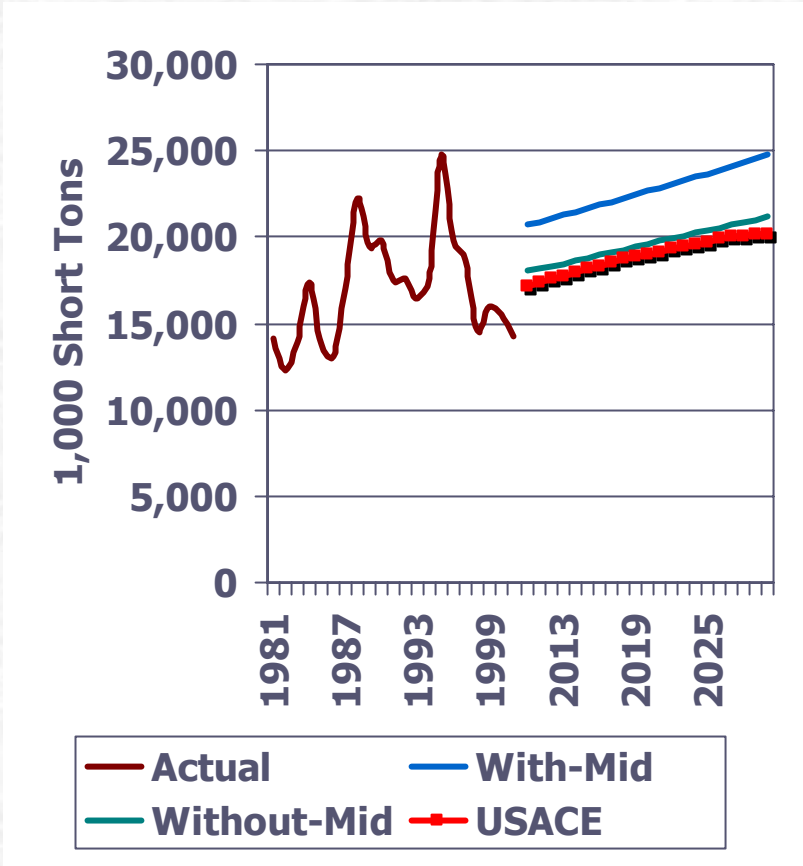
- With the deepening project, the midpoint forecast projects 17% more grain (of all types) than under without project conditions.
  - With project, average growth rate is 1.1% - average from 1995 to 2001 to 2030.
  - Without project average growth rate is 0.6% - average from 1995 to 2001 to 2030).
- Fuller (et al) have projected a 16% increase in PNW traffic associated with $1.25 per ton raise in Panama Canal tolls. The ocean carrier costs could decrease by this amount as a result of Columbia River deepening project.



Columbia River Grain Forecast – With/Without Channel Deepening

Source: DRI-WEFA/ BST Associates

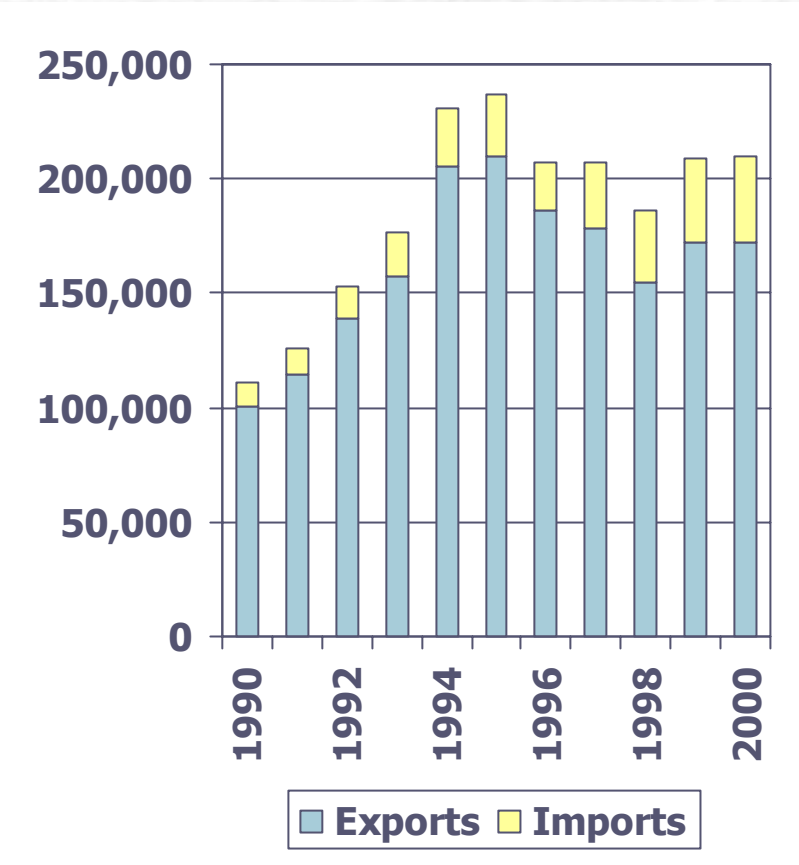
- USACE used a forecast slightly lower than the BST/DRI-WEFA without project forecast in the revised study.
  - Sorghum was not included in the USACE analysis.
- Using the with-project forecast would substantially increase project benefits.



Containers

Portland Container Trends (Loaded TEUS)

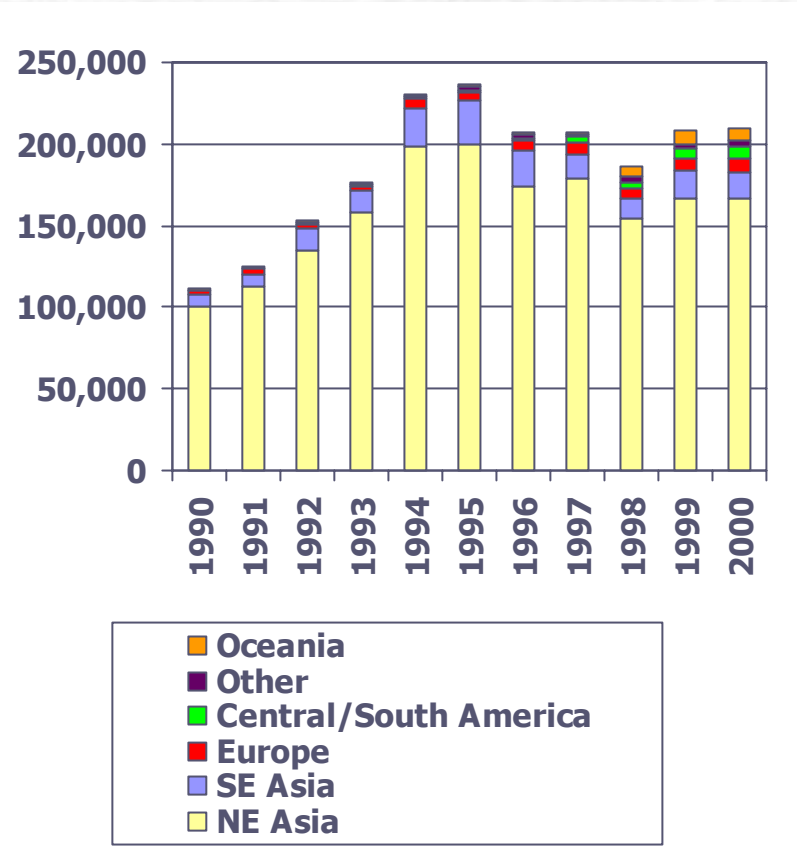
Source: PIERS



- Exports accounted for 90% of containers in 1990, and now account for 82%.
  - Portland exports fell 2% per year between 1995 and 2000.
  - Overall west coast exports to Asia dropped –0.8% per year.
  - Other ports also dropped exports (Seattle declined at 9.8% and Long Beach at 3.9% per year).
- Decline in exports due to several factors:
  - Impact of Asian Financial Crisis and strength of the US dollar.
  - For the Columbia River, the advent of post-Panamax vessels in Seattle and Tacoma.

Portland Container Trends (Loaded TEUS)

Source: PIERS



- Portland (like other West Coast ports) is dependent on Asian trades.
  - NE Asia accounts for 90% of traffic in 1990 but declined to 80% in 2000.
  - SE Asia was 6% in 1990 and is now 8%.
- Other trade routes have grown rapidly.
  - Now account for 13% of traffic.
  - Smaller vessels are on non-Asian routes.

Portland's Regional Hinterland

- The local container market consists of an area including the state of Oregon, Southern Idaho, and the barge tributary serving Southeast Washington and Northern Idaho.
- Products in this market area can either move via Columbia River ports (primarily the Port of Portland) or container ports in Puget Sound (primarily Seattle and Tacoma).
  - Portland only competes indirectly with Southern California ports for carriers determining the number of port calls on the West Coast.
- Portland's share of the local market depends on a number of factors, including the number of containers moving to and from each country/region, the relative frequency of service provided by ocean carriers and relative inland transport costs, among other factors. The carrier cost is impacted by channel depth.

Container Forecast Methodology

- DRI-WEFA forecasts are demand driven by commodity for key trading partners. Step 1 entailed evaluating supply constraints for export commodities.
- Project the size of the local Trans-Pacific traffic base in the Portland regional market area,
- Estimate Portland's share of this local traffic base,
- Project intermodal cargo on Trans-Pacific trade routes.
- Project containerized trade with non-Trans-Pacific trade partners.
- Sum equals full TEUS, add empties to project total TEUS.

Supply Constrained Forecasts

- DRI-WEFA's forecasts are demand driven but some commodities may have supply constraints. BST Associates ratcheted down forecasts, taking into account existing production levels and percent of products in export trades.
- Examples:
  - Hay and animal feed – projected at 1.4% (low) to 2.3% (high) per year. 2030 volumes will amount to 18% to 36% of existing production levels (12% exported at present time).
  - Lumber exports – projected to increase at between 1.0% (low) and 3.1% (high), representing between 4% (low) and 8% (high) of existing productive capacity (Currently 3.3% is exported).
  - Demand driven forecasts project growth between 2.7% (low) and 4.8% (high). The supply constrained forecasts are expected to rage from 1.6% (low) to 3.1% (high).

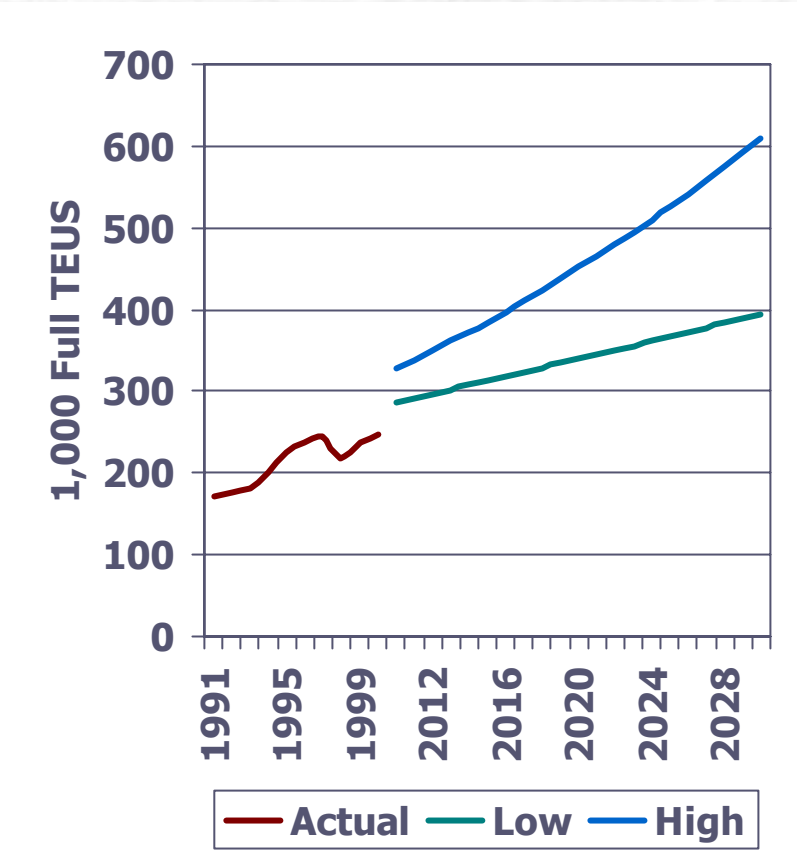
Supply Constrained Commodity Forecasts

Source: DRI-WEFA/ BST Associates (1,000 Metric Tons)

			2030		Growth % 2000-2030	
Rank	Product Description	2000	Low	High	Low	High
1	Hay And Animal Feed	615.4	933.9	1,217.3	1.4%	2.3%
2	Paper & Paperboard	162.2	218.6	340.2	1.0%	2.5%
3	Lumber, Softwood	139.5	188.1	384.3	1.0%	3.4%
4	Waste Paper	118.8	215.2	323.1	2.0%	3.4%
5	Milk Carton Stock	112.6	151.7	318.9	1.0%	3.5%
6	Potatoes, Frozen	91.3	155.9	221.5	1.8%	3.0%
7	Lumber, Hardwood	44.7	60.2	80.9	1.0%	2.0%
8	Wood Pulp	39.6	53.4	66.0	1.0%	1.7%
9	Lentils, Dried Shelled	38.8	43.0	81.4	1.2%	2.5%
10	Other Base Metals	35.2	30.3	40.9	-0.5%	0.5%
11	Whey	34.1	41.6	126.0	0.7%	4.5%
12	Flour Meal & Pellet Meat	24.3	90.1	151.6	4.5%	6.3%
13	Sweet Corn, Not Frozen	22.2	21.8	40.1	-0.1%	2.0%
14	Articles Of Asphalt	20.3	25.0	31.8	0.7%	1.5%
15	Peas, Dried Shelled	19.6	26.4	36.1	1.0%	2.1%
16	Fiberboard/Particle Board	19.3	20.2	38.3	0.2%	2.3%
17	Onions/Shallots, Fresh/Chilled	18.6	27.4	42.2	1.3%	2.8%
18	Hides & Skins	16.2	49.6	92.6	3.8%	6.0%
19	Newsprint	16.2	25.0	41.7	1.5%	3.2%
20	Malt, Not Roasted	15.8	28.5	52.0	2.0%	4.0%
	Misc	328.7	725.8	1,101.6	2.7%	4.8%
	Grand Total	1,933.4	3,131.8	4,828.7	1.6%	3.1%

Local Transpacific Exports in Regional Hinterland

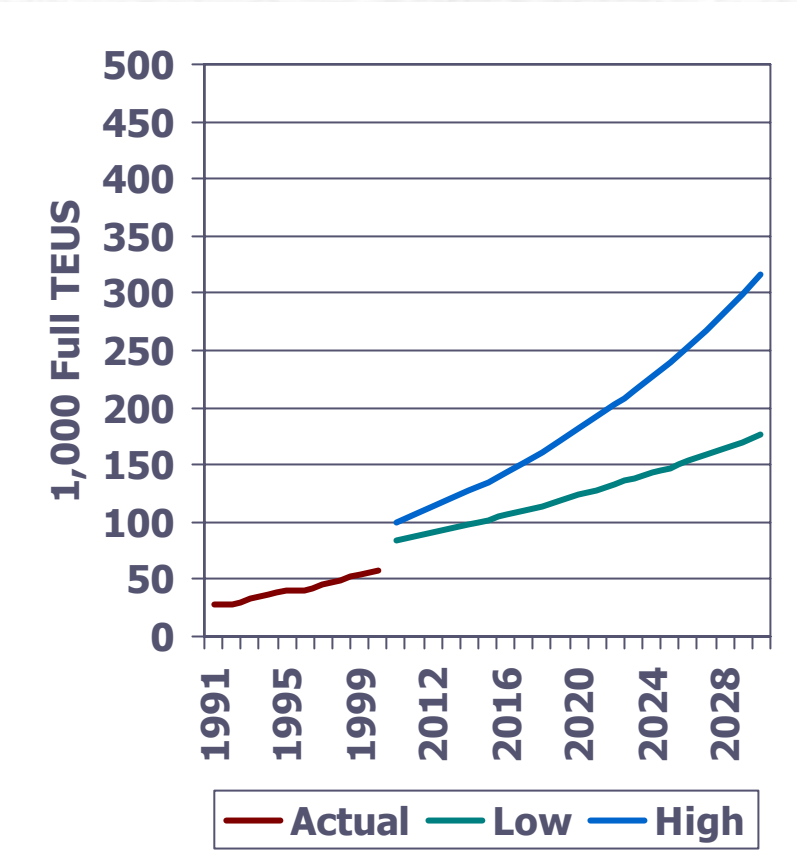
Source: DRI-WEFA/ BST Associates (1,000 Full TEUS)



- The hinterland region generated 250,000 full TEUS bound for export to Transpacific trade lanes in 1995 and 2000 (growth of 4.2% per year from 1991 to 2000).
- The hinterland region is expected to generate 400,000 to 600,000 full export TEUS by 2030.
  - Low – 1.6%/year
  - High – 3.0%/year.

Local Transpacific Imports in Regional Hinterland

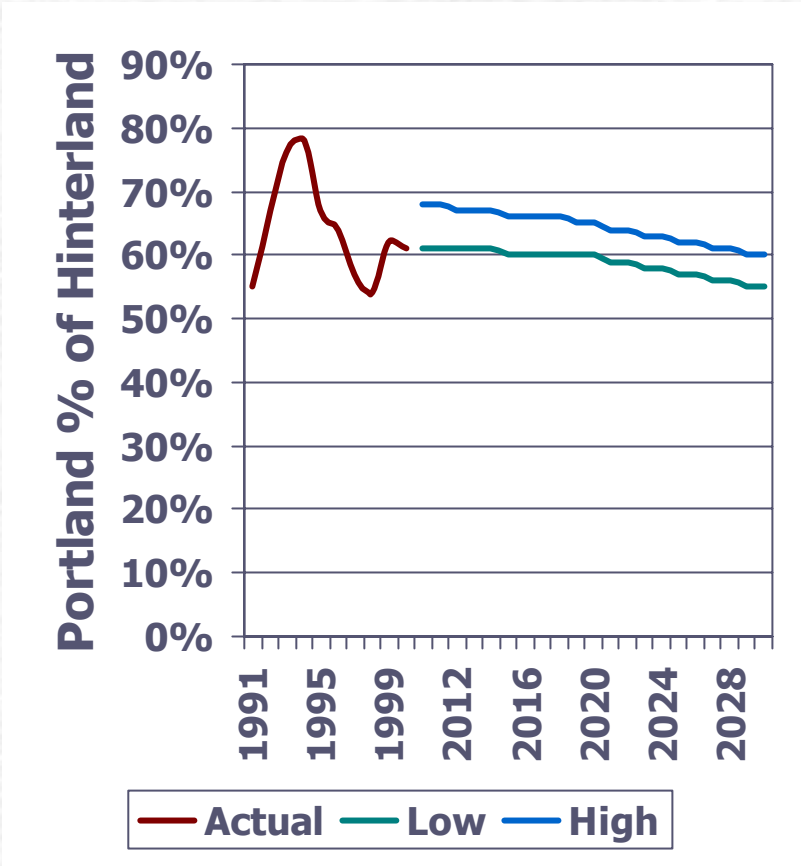
Source: DRI-WEFA/ BST Associates (1,000 Full TEUS)



- The hinterland region generated 50,000+ full TEUS imported on Transpacific trade lanes in 2000 (8.7% per year).
- The hinterland region is expected to generate 175,000 to 300,000 full import TEUS by 2030.
  - Low – 3.8%/year
  - High – 5.8%/year.

Portland Capture of Transpacific Exports in Regional Hinterland

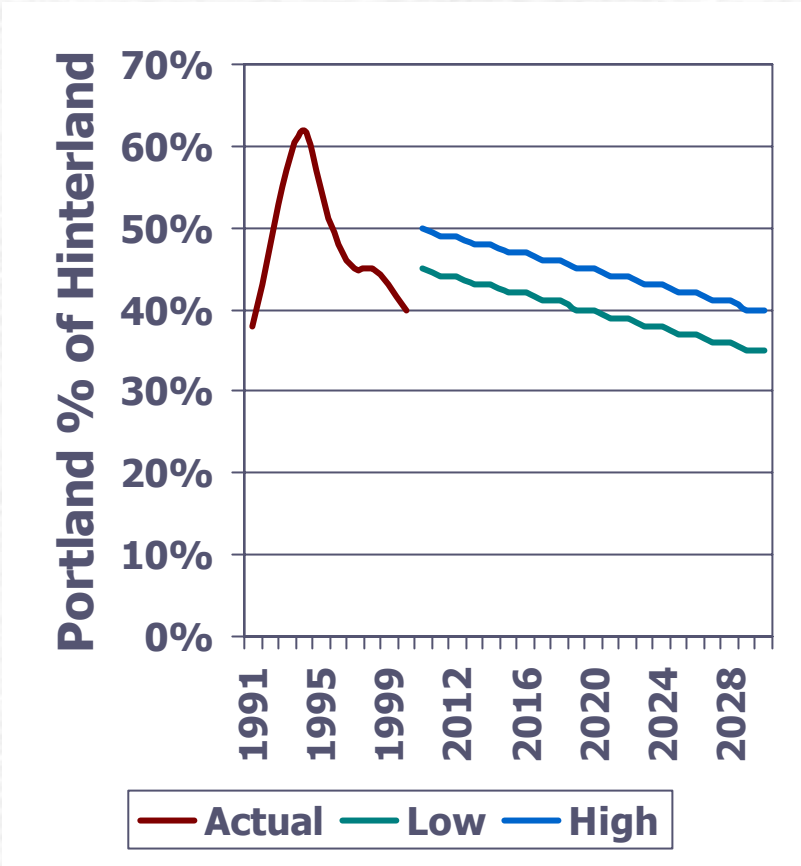
Source: DRI-WEFA/ BST Associates (%)



- Portland captured between 55% and 80% of transpacific exports from the hinterland between 1991 and 2000.
- Portland is expected to capture:
  - Low – 61% in 2010 declining to 55% in 2030
  - High – 68% in 2010 declining to 60% in 2030
  - Declining % assumes larger container vessels in 2030 than in 2010.

Portland Capture of Transpacific Imports in Regional Hinterland

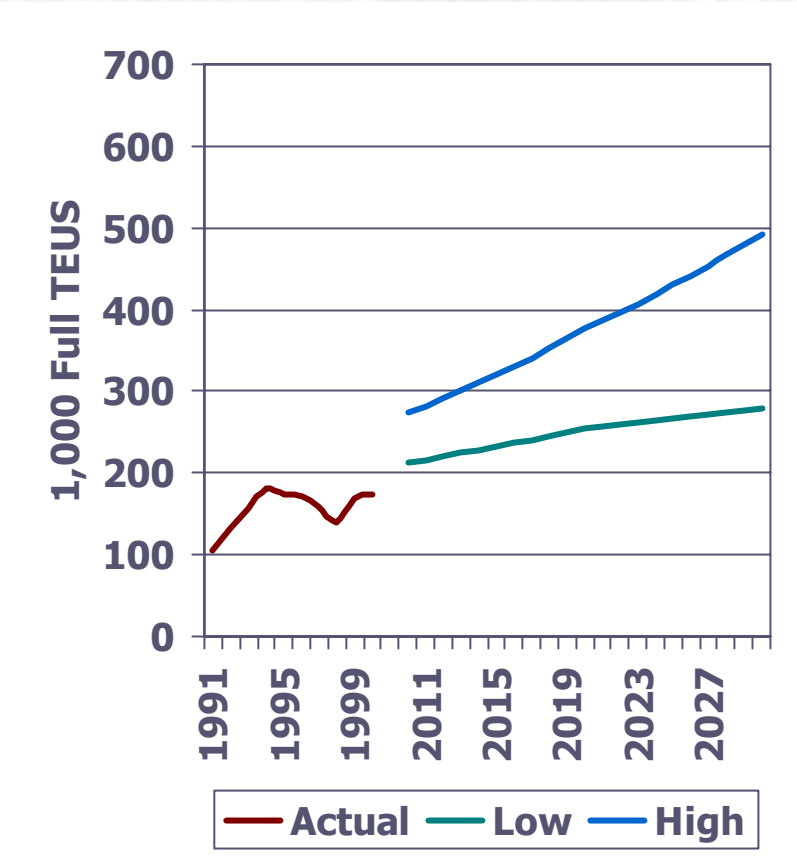
Source: DRI-WEFA/ BST Associates (%)



- Portland captured between 40% and 62% of transpacific imports into the hinterland between 1991 and 2000.
- Portland is expected to capture:
  - Low – 45% in 2010 declining to 35% in 2030
  - High – 50% in 2010 declining to 40% in 2030
  - Declining % assumes larger container vessels in 2030 than in 2010.

Portland's Local Transpacific Trade within Regional Hinterland

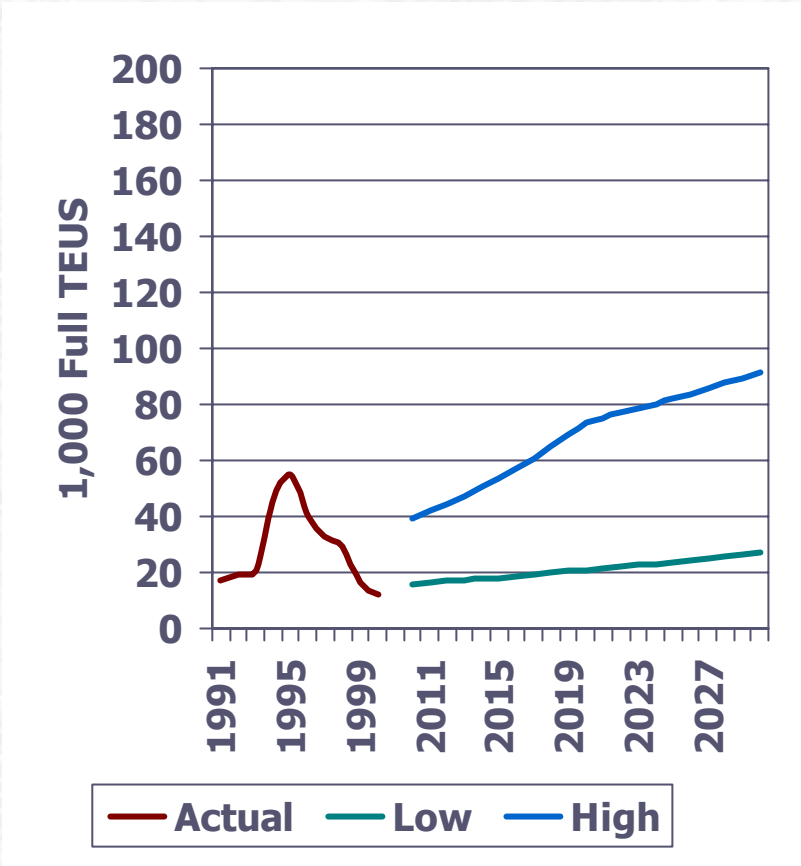
Source: DRI-WEFA/ BST Associates (1,000 Full TEUS)



- Portland generated between 100,000 and 200,000 full TEUS in Trans-Pacific trade from the hinterland between 1991 and 2000 (averaged 5.8% per year from 91 to 00).
- Portland is expected to generate 300,000 to 500,000 full export & import TEUS by 2030.
  - Low – 1.6%/year
  - High – 3.5%/year.

Transpacific Intermodal Exports

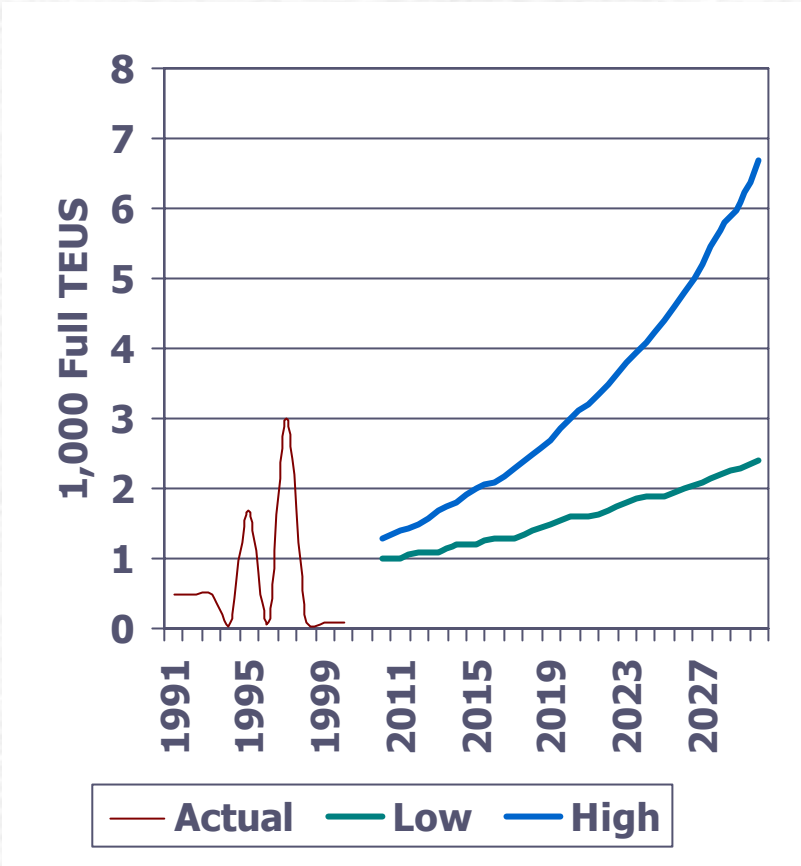
Source: DRI-WEFA/ BST Associates (1,000 Full TEUS)



- Portland had 10,000 to 55,000 intermodal exports on Transpacific trade lanes between 1991 and 2000.
- Portland is expected to generate between 35,000 and 90,000 full export TEUS by 2030.
  - Low – 2.6%/year (2000-30)
  - High – 6.9%/year.
- Intermodal exports accounted for 8% to 27% of Trans-Pacific traffic between 1990 and 2000. Projected to equal 11% (low) to 20% (high).

Transpacific Intermodal Imports

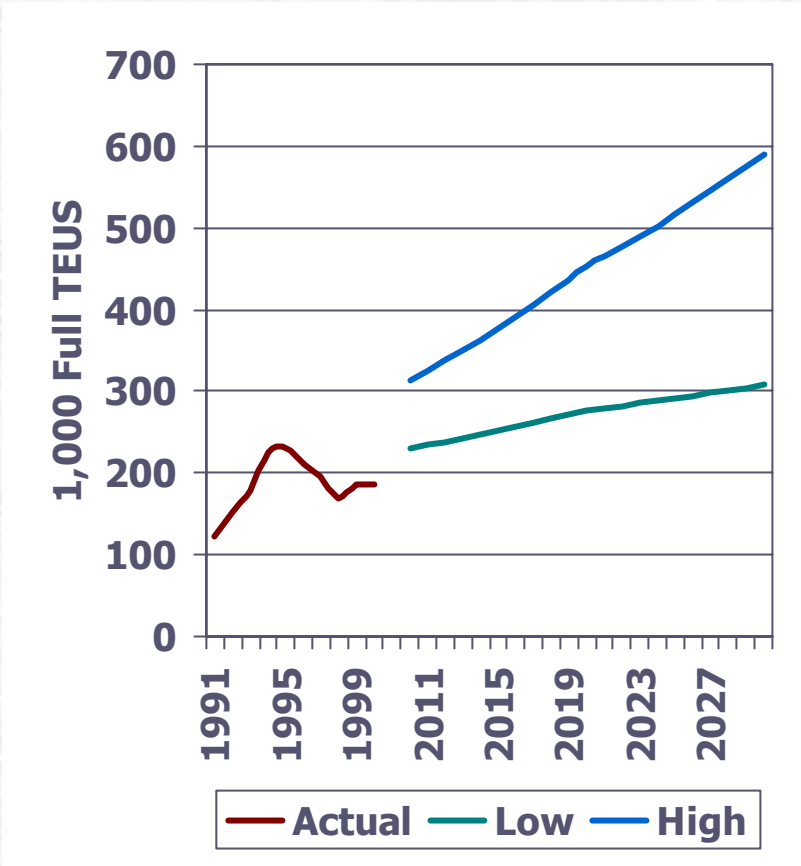
Source: DRI-WEFA/ BST Associates (1,000 Full TEUS)



- Portland had 100 to 3,000 intermodal imports on Transpacific trade lanes between 1991 and 2000.
- Portland is expected to generate between 2,400 and 6,700 full import TEUS by 2030.
- Intermodal imports accounted for 1% to 13% of Trans-Pacific traffic between 1990 and 2000. Projected to equal 4% (low) to 5% (high).

Portland's Total Transpacific Trade

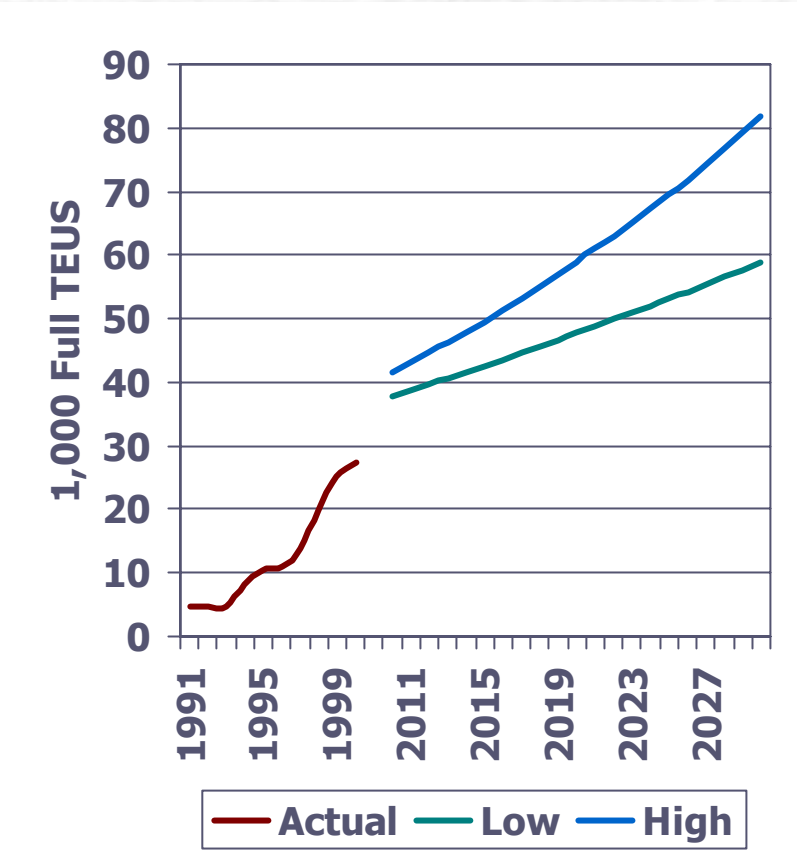
Source: DRI-WEFA/ BST Associates (1,000 Full TEUS)



- Portland generated between 122,000 and 220,000 full TEUS in Trans-Pacific trade between 1991 and 2000 (averaged 4.9% per year from 91 to 00).
- Portland is expected to generate 308,000 to 591,000 full export & import TEUS by 2030.
  - Low – 1.7%/year
  - High – 3.9%/year.

Portland's Total non-Transpacific Trade

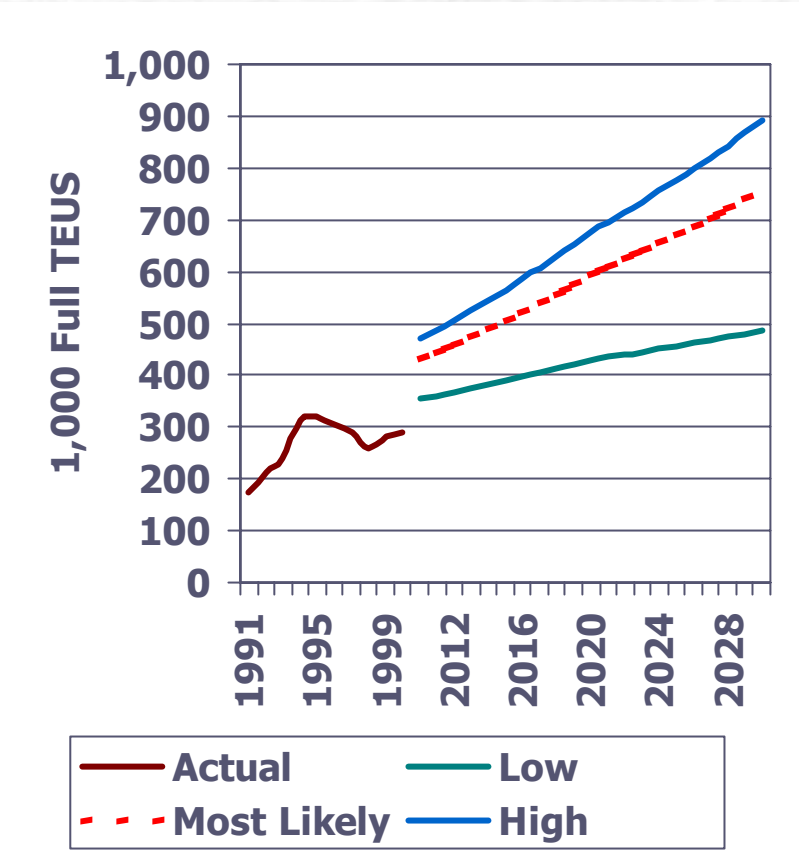
Source: DRI-WEFA/ BST Associates (1,000 Full TEUS)



- Portland's non-Transpacific trade grew from 4,800 TEUS in 1991 to 27,300 TEUS in 2000 (averaged 21.3% growth per year from 91 to 00).
- Portland is expected to generate 58,800 to 81,900 full export & import TEUS by 2030.
  - Low – 2.6%/year
  - High – 3.7%/year.

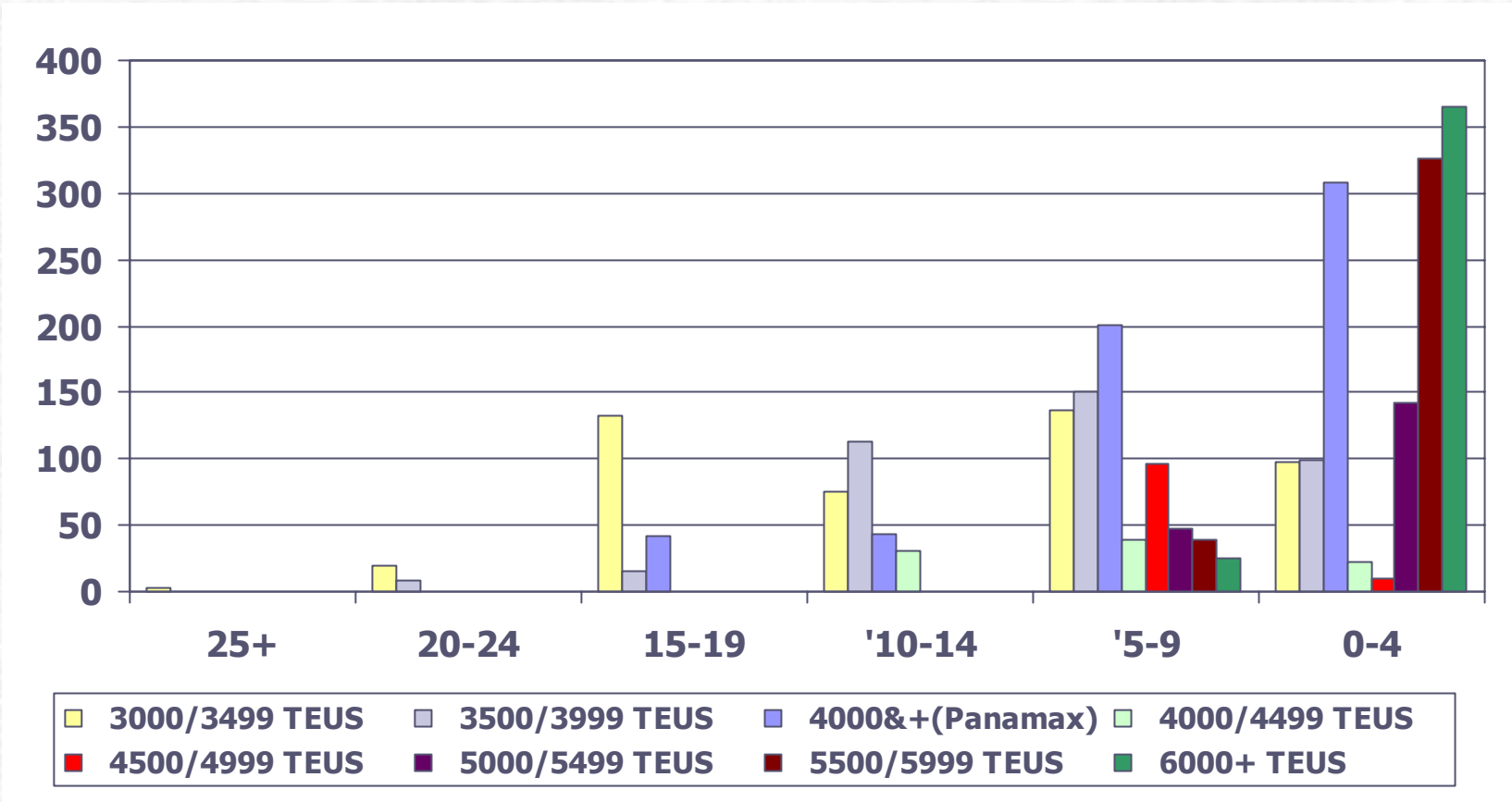
Portland's Total Container Trade

Source: DRI-WEFA/ BST Associates (1,000 Full & Empty TEUS)



- Portland's total container trade grew from 173,200 TEUS in 1991 to 288,100 TEUS in 2000 (averaged 5.8% growth per year from 91 to 00).
- Portland is expected to generate 486,200 (low) to 891,700 (high) full export & import TEUS by 2030.
  - Low – 1.8%/year
  - High – 3.8%/year
  - Most Likely – 3.2%.
- Empties have averaged 25% of total TEUS for several years and are expected to continue at this level.

World Panamax & Post-Panamax Fleet Existing Characteristics Source: Clarkson Research



Container Order Book

Source: Clarkson Research

- During the period 1996 through 2002, there were 351 container vessels on order with a carrying capacity exceeding 3,000 TEUS on the order book. The average size of the vessel increased from approximately 4,500 TEUS to approximately 5,000 TEUS during this time period. Approximately 80% of the vessels ordered had a capacity of less than 6,000 TEUS:
  - 23% of the vessels had a capacity of 3,000 to 3,999 TEUS,
  - 27% of the vessels had a capacity of 4,000 to 4,999 TEUS,
  - 32% of the vessels had a capacity of 5,000 to 5,999 TEUS,
  - 14% of the vessels had a capacity of 6,000 to 6,999 TEUS,
  - 5% of the vessels had a capacity of 7,000 or more TEUS,

Characteristics of Panamax & Post-Panamax Vessels Source: Clarkson Research

	Avg. Size/Age					Average		Average		
	Nom	Hom		Dwt per	Average	Speed/Cons		Dimensions (ft.)		
Vessel Size	Teu	Teu	Dwt	Teu	Age	Knots	t/day	LOA	Beam	Draft
3000/3499 TEUS	3,229	2,505	45,180	14	11	21.7	95.3	820.3	105.6	39
3500/3999 TEUS	3,752	2,651	50,754	13.5	8.7	23.1	118.9	885.9	105.6	40.7
4000&+(Panamax)	4,331	3,217	60,490	14	6.3	23.5	141.7	945.9	105.6	42.3
Total Panamax	3,763	2,796	52,138	13.9	8.7	22.8	119.7	882.6	105.6	40.7
4000/4499 TEUS	4,199	3,331	59,647	14.3	8	24.1	154.5	895.7	124	44.3
4500/4999 TEUS	4,842	4,679	65,098	13.4	6.6	24.2	180.9	933.1	128	44.3
5000/5499 TEUS	5,281	4,120	67,167	12.7	3.9	25	201	915.7	131.2	44.9
5500/5999 TEUS	5,614	4,166	67,579	12	2.1	25.2	211.7	915.4	131.2	44.9
6000+ TEUS	6,619	5,601	88,005	13.3	2.6	24.6	209.4	1,034.80	136.2	45.9
Total Post-Panamax	5,610	4,463	72,291	12.9	3.7	24.7	196.6	948.5	131.6	44.9

Container Vessel Characteristics on the U.S. West Coast

Source: Port of Portland Utilizing PIERS data

Vessel Type	# of Vessels	TEU Capacity	Avg. TEU Capacity	Total Westbound M. Tons	Total Westbound TEUs
Sub-Panamax	205	432,774	2,111	4,711,124	463,209
Panamax	225	851,324	3,784	10,187,511	1,032,918
Post-Panamax	75	398,526	5,314	8,040,613	817,927
Post-Panamax Large	19	129,863	6,835	2,730,017	266,460
Total	524	1,812,487	3,459	25,669,265	2,580,515
Percent of Fleet					
Sub-Panamax	39%	24%	18%	18%	18%
Panamax	43%	47%	40%	40%	40%
Post-Panamax	14%	22%	31%	32%	32%
Post-Panamax Large	4%	7%	11%	10%	10%
Grand Total	100%	100%	100%	100%	100%

Water Depths of Container Vessels on Asian Routes in Seattle

Source: BST Associates, USACE, Puget Sound Pilots

Total Calls Inbound			**38**	**39**	**40**	**41**	**42**	**43**
Asia	Last	C 40-60000	-	-	-	1	-	-
Asia	Last	E 65-80000	1	1	-	1	-	-
Asia	Mid	C 40-60000	6	3	-	-	-	-
Asia	Mid	E 65-80000	-	-	-	-	1	-
Total Calls Outbound			**38**	**39**	**40**	**41**	**42**	**43**
Asia	Last	B 30-40000	3	-	-	-	-	-
Asia	Last	C 40-60000	-	1	-	-	-	-
Asia	Last	E 65-80000	10	11	14	19	-	1
Asia	Mid	C 40-60000	6	3	-	-	-	-
Asia	Mid	D 60-65000	1	-	1	1	-	-
Asia	Mid	E 65-80000	-	1	1	1	1	-

Note: data includes actual vessel drafts for vessels operated by Hanjin, Hyundai and Costco vessels calling the East Waterway in Seattle during 1999. The third column from shows the range of deadweight tonnage of the vessel.

Vessel Operating Conditions

- Vessels in the 4,000 to 7,000 TEU range will continue to operate on the U.S. West Coast to 2030.
- Portland currently has three services:
  - Kline - 3,500 TEU with 42 foot fresh water draft (upgrading in near future to 4,000+)
  - Hyundai – 4,400 TEU with 46 foot fresh water design draft
  - Hanjin – 4,400 TEU with 44 foot fresh water design draft
- Future use assumes 50% in 44-foot and 50% in 46-foot design draft vessels
- Operators call in Columbia River at around 2 feet underkeel clearance using Loadmax.
  - Most USACE studies use 5 feet of underkeel clearance, which would significantly increase project benefits.
- Deepening project will increase carrying capacity by 1 million tons of additional tare weight capacity (around 100,000 TEUs) for existing operators.

Portland Container Export Forecast – With & Without Project

Source: DRI-WEFA/ BST Associates (1,000 Full TEUS)